

**Dale Tract
Year Three Monitoring Report**

Brunswick County, NC

Prepared for:
ECOBANK
Winter Park, FL

Prepared by:
Land Management Group, Inc.
Wilmington, NC

November 2003

Table of Contents

1.0 Introduction.....	1
2.0 Hydrology	2
2.1 <u>Success Criteria</u>	2
2.2 <u>Methods</u>	2
2.3 <u>Results</u>	3
3.0 Vegetation	4
3.1 <u>Success Criteria</u>	4
3.2 <u>Methods</u>	5
3.3 <u>Results</u>	5
4.0 Conclusions.....	6

Tables, Figures, and Appendices

Table 1. Groundwater monitoring results for gauges located at Dale.....	4
Table 2. Groundwater monitoring results for reference gauges located at Eagle Brunswick.....	4
Table 3. Dominant vegetation at the Eagle Brunswick reference area.....	5
Table 4. Number of pond pine and loblolly bay trees found in each plot at Dale...	6

Figure 1. Vicinity map	7
Figure 2. Location of monitoring gauges at site.....	8
Figure 3. Location of vegetation monitoring plots at site.....	9

Appendix A. Hydrographs

Figure A.1. Hydrology Monitoring, Gauge A1
Figure A.2. Hydrology Monitoring, Gauge A2
Figure A.3. Hydrology Monitoring, Gauge A3
Figure A.4. Hydrology Monitoring, Gauge B1
Figure A.5. Hydrology Monitoring, Gauge B2
Figure A.6. Hydrology Monitoring, Gauge B3
Figure A.7. Hydrology Monitoring, Gauge B4
Figure A.8. Hydrology Monitoring, Gauge E1
Figure A.9. Hydrology Monitoring, Gauge E2
Figure A.10. Hydrology Monitoring, Gauge E3
Figure A.11. Hydrology Monitoring, Gauge C1
Figure A.12. Hydrology Monitoring, Gauge C2
Figure A.13. Rainfall Analysis for 2003

Appendix B. Pictures of site

Dale Tract
Year Three Monitoring Report
Brunswick County, NC

1.0 Introduction

As part of mitigation for unavoidable wetland impacts associated with the construction of the Wilmington Bypass by the North Carolina Department of Transportation, ECOBANK proposed to restore 220 acres and enhance an additional 18 acres of wet pine flats at the Dale Tract in Brunswick County, North Carolina (Figure 1) as described in the Revised Compensatory Mitigation Plan for the Dale Tract dated July 21, 2000. This 238-acre tract historically consisted almost entirely of wet pine flats. However, several large ditches were installed the length of the property in order to drain soils and harvest trees from the area. These ditches altered hydrology, yet vegetation typical of a wet pine flat still persists at the site. Based on pre-project groundwater data collected at the Eagle Brunswick Tract (located approximately 4 miles from Dale), it was determined that ditches had a 300' drainage effect, which was used to establish restoration and enhancement boundaries. The mitigation plan did not require the collection or analysis of pre-project hydrologic data from the Dale Tract.

In order to restore wetland hydrology at the Dale tract, all on-site ditches were filled in December of 1999. Automated groundwater monitoring gauges were then placed in transects throughout the site to collect hydrology data. Although the mitigation efforts did not include planting wetland vegetation, six monitoring plots were located within the site and existing vegetation was analyzed to verify that the ditch-filling has not negatively affected species composition or numbers.

The hydrology and vegetation data collected in 2003 are presented in this document. It should be noted that the two previous monitoring reports for this site determined that the Dale site has achieved both the vegetative and hydrological success criteria and the site is thus far a mitigation success. This site will be monitored for at least a total of five years, or until the project is deemed successful.

2.0 Hydrology

2.1 Success Criteria

According to the Dale Tract Mitigation Plan, the wetland hydrology success criterion for this site is the establishment of a static water table at or within 12" of the soil surface, ponded or flooded for 12.5% of the growing season during normal precipitation conditions. The growing season in Brunswick County extends 265 days, between March 7 and November 28. Normal precipitation is defined as total monthly precipitation falling within the 30th and 70th percentiles of a 30-year period. Therefore, to meet the success criterion, the water table should remain at or within 12" of the soil surface for at least 33 consecutive days between March 7 and November 28. However, because of awareness in the scientific community that undisturbed pocosin/pine flat wetlands do not always meet this 12.5% threshold, this criterion is subject to redefinition based on groundwater results from the reference gauges, as stated on page 12 of the mitigation plan. A redefinition of the hydrological success criterion is not requested in this monitoring report.

2.2 Methods

In December of 1999, 4.4 miles of ditches within the Dale Tract were filled to restore wetland hydrology to the site. According to the Dale Tract Mitigation Plan, a total of twelve automated groundwater monitoring gauges were to be installed throughout the site to monitor groundwater hydrology for at least five years. Nine of these gauges were located in restored wetlands and the remaining three gauges were installed in enhanced wetlands (Figure 2). Hydrology data from these gauges were to be compared to two gauges located in reference wetlands at the Eagle Brunswick Tract.

Several gauges were installed at the end of 1999 and throughout 2000 at the Dale site. Vandals and bears broke a majority of these gauges in 2000 and 2001. Hydrology data could not be retrieved from most of the broken gauges and

resulted in lost information. To discourage the vandals, camouflaged gauges were installed in the summer and fall of 2000, and little or no flagging was used to identify their location. Vandalism and bear problems were greatly reduced in 2002 and 2003.

2.2 Results

Eleven of the twelve gauges at the Dale Tract met the 12.5% hydrology criterion for 2003, which is a water table within 12" of the soil surface for 12.5% of the growing season (33 days). Most of the gauges greatly exceeded this minimum. The one gauge that did not achieve this criterion (E3) stopped functioning during the growing season. As shown in Appendix A, most of the gauges documented wetland hydrology during the early and mid part of summer. The reference gauges (R1 and R2) located within the Eagle Brunswick tract reflected the same patterns as the gauges located at Dale, and documented wetland hydrology for 124 and 75 days, respectively (Table 2).

Unlike 2002, which experienced very dry conditions, the 30-day running total for 2003 shows normal or above normal rainfall for most of the year (Appendix A).

Table 1. Groundwater monitoring results for gauges located within the Dale Tract in 2001, 2002, and 2003.

Type	Gauge Number	Serial Number	# of Consecutive Days above 12" 2001	# of Consecutive Days above 12" 2002	# of Consecutive Days above 12" 2003
Restoration	A1	S448917	35	35	65
	A2	S213AB6	45	4*	68*
	A3	S44882F	37	*	45
	B1	S5588B6	45	*	75
	B2	S562513	38	37	113*
	B3	S353B58	41	37	68
	B4	S328B05	7*	14	65
	C1	S127197	57	35	120*
	C2	S560A5D	22*	*	193
Enhancement	E1	S213F49	51	36	121
	E2	S213D95	68	36	151*
	E3	S353A6E	45	missing	27*

* Gauges stopped reading during the growing season.

Table 2. Groundwater monitoring results for reference gauges located within the Eagle Brunswick Tract in 2001, 2002, and 2003.

Type	Gauge Number	Serial Number	# of Consecutive Days above 12" 2001	# of Consecutive Days above 12" 2002	# of Consecutive Days above 12" 2003
Reference	R1	S378395	9	36	124
	R2	S317403	11	35	75

3.0 Vegetation

3.1 Success Criteria

As established in the mitigation plan, the vegetation criterion for the Dale site was a minimum of 320 trees per acre, specifically of pond pine (*Pinus serotina*) and loblolly bay (*Gordonia lasianthus*).

3.2 Methods

Although no wetland vegetation was planted within the Dale Tract, vegetation monitoring was included as a part of the mitigation plan in order to evaluate whether the ditch-filling activities had any negative consequences on existing vegetation. Six circular plots, each with a 10' radius, were randomly located within restoration and enhancement areas throughout the site (Figure 3). The number and species of trees were noted and then compared to the vegetation within the wet pine flat reference area at the Eagle Brunswick tract (Table 3).

Table 3. Dominant vegetation at the pine flat reference area of Eagle Brunswick.

Dominant Overstory	Dominant Shrub/Sapling	Dominant Herbaceous
<i>Pinus serotina</i>	<i>Gordonia lasianthus</i> <i>Lyonia lucida</i> <i>Cyrilla racemiflora</i> <i>Ilex glabra</i>	<i>Ilex glabra</i> <i>Lyonia lucida</i>

3.3 Results

Each plot surveyed had a 10' radius and, therefore, contained 314 ft². Because six plots were counted, the total area surveyed was 1884 ft². To extrapolate the vegetation to one acre, the total number of pond pines and loblolly bays found in the six plots was multiplied by 23.1.

The Dale site contained an average of 1455.3 of these species per acre (Table 4). This was similar to the results from 2001 (1433.5 trees/acre) and 2002 (1386 trees/acre) and well above the 320 trees per acre criterion established in the mitigation plan. Therefore, the vegetation criterion for year three monitoring was fulfilled.

Table 4. Number of pond pine and loblolly bay trees found in each plot at the Dale Tract in 2003.

Plot #	Pond Pine (<i>Pinus serotina</i>)	Loblolly Bay (<i>Gordonia lasianthus</i>)
1	-	6
2	5	13
3	-	8
4	2	5
5	2	9
6	3	10
Total	12	51

As in previous years, other vegetation observed at Dale included titi (*Cyrilla racemiflora*), sweet pepperbush (*Clethra alnifolia*), fetterbush (*Lyonia lucida*), gallberry (*Ilex glabra*), and bracken fern (*Pteridium aquilinum*), which were mainly found in the shrub and herbaceous layers (Appendix B). The filled ditches were vegetated with herbaceous species such as broomsedge, (*Andropogon glomeratus*), soft rush (*Juncus effusus*), and goldenrod (*Solidago spp*). Exact counts of these species were not conducted since they did not factor into the vegetation criterion.

4.0 Conclusions

Hydrology data from 2003 revealed that eleven of the twelve monitoring gauges throughout the restored and enhanced areas of the Dale tract met the 12.5% wetland hydrology criterion established in the mitigation plan. Most of the gauges greatly exceeded this minimum. The one gauge that did not achieve this criterion (E3) stopped functioning during the growing season.

Vegetation monitoring found the Dale Tract to contain dense stands of wet pine flat plant species such as gallberry, fetterbush, and sweet pepperbush. In addition, an average of 1455.3 trees per acre of pond pine and loblolly bay were observed in the canopy and shrub layer throughout the tract. This greatly exceeded the vegetation criterion of 320 trees per acre of these two species. Because both hydrology and vegetation criteria have been achieved during the past three years, the wetland mitigation at the Dale site can be considered a success thus far.